Reciprocal theorem: From local equations to symmetry over the whole system

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Onsager's reciprocal symmetry is typically used to derive local constitutive equations through a variational approach. We consider a non-equilibrium system close to the global equilibrium state. We show that the reciprocal symmetry for local constitutive equations can be extended to a new symmetry over the whole system. This symmetry is manifested in the kinetic coefficients connecting the forces and fluxes defined at the system boundary. Our results generalize the Lorentz theorem for Stokes flows.